

GEORGE WESTINGHOUSE BRIDGE
(Lincoln Highway, Bridge over Turtle Creek)
Pennsylvania Historic Bridges Recording Project
Spanning Turtle Creek at Lincoln Hwy. (U.S. Rt. 30)
East Pittsburgh
Allegheny County
Pennsylvania

HAER No. PA-446

HAER
PA
2-EAPIT,
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HISTORIC AMERICAN ENGINEERING RECORD

National Park Service

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Location: Spanning Turtle Creek at Lincoln Hwy. (U.S. Rt. 30), East Pittsburgh, Allegheny County, Pennsylvania.

USGS Quadrangle: Braddock, Pennsylvania (7.5-minute series).

UTM Coordinates: 17/598650/4471900

Dates of Construction: 1929-1932.

Designer: Allegheny County Department of Public Works; Pennsylvania Department of Highways.

Builder: Booth & Flinn Company, contractor.

Present Owner: Pennsylvania Department of Transportation.

Present Use: Vehicular bridge.

Significance: Hailed as "America's Longest Concrete-Arch Bridge" when it opened in 1932, the George Westinghouse Bridge's 450'-0" main span remains one of the longest concrete arch spans in the United States. This structure represents the highest engineering skill in concrete arch bridge construction. Engineers designing and constructing the George Westinghouse Bridge overcame challenges presented by the extreme depth and width of Turtle Creek valley, which this bridge spans. The structure was listed in the National Register of Historic Places in 1977.

Historian: Dr. David S. Rotenstein, August 1997.

Project Information: This bridge was documented by the Historic American Engineering Record (HAER) as part of the Pennsylvania Historic Bridges Recording Project - 1, co-sponsored by the Pennsylvania Department of Transportation (PennDOT) and the Pennsylvania Historical and Museum Commission during the summer of 1997. The project was supervised by Eric DeLony, Chief of HAER.

CHRONOLOGY

- 14 August 1929 Allegheny County and the Commonwealth of Pennsylvania agree to build a bridge on the Lincoln Highway spanning Turtle Creek valley.
- 16 January 1930 Allegheny County Commissioners approve request to name the bridge "George Westinghouse Bridge" and forward the request to the Pennsylvania Department of Highways.
- 6 May 1930 Booth & Flinn Company is awarded the contract to build the bridge.
- 10 September 1932 George Westinghouse Bridge is dedicated.
- 28 March 1977 "George Westinghouse Memorial Bridge" is listed in the National Register of Historic Places.

DESCRIPTION

The George Westinghouse Bridge is an impressive modern monumental structure. Spanning Turtle Creek valley for a total length of 1,560'-0", the bridge carries U.S. Route 30 at an elevation of about 200 feet above the valley floor. The bridge is comprised of five open-spandrel reinforced concrete parabolic arches anchored by four piers into a solid bedrock foundation (Table 1). The bridge carries a 42'-0" roadway (four lanes) and two 7'-0"-wide sidewalks.

The structure's spans, numbered sequentially from west to east, have the following measurements:

Table 1 George Westinghouse Bridge Span Measurements.

Span	Length	Rise
1	196'-4"	96'-6"
2	295'-0"	96'-6"
3	460'-0"	153'-6"
4	295'-0"	96'-6"
5	277'-6"	96'-6"

Source: G. S. Richardson, "A Concrete Arch of 460-Ft. Span," *Engineering News-Record* 106 (23 Apr. 1931): 682.

Each arch is comprised of two ribs 14'-0" wide, designed "for a maximum working stress of 800 lb. per sq. in. under combined dead load, live and impact load."¹ George Richardson, Allegheny County's assistant engineer of bridge design, further described the arches as having a 1:50 ratio of crown depth to span and:

The ratio of rib depth at springing to that at the crown is dependent largely upon the ratio of rise to span. In this case, with a high rise of 158 ft. and a span at springing of 411.52, the ratio is nearly 0.4, so that the depth at the springing line was made twice that at the crown.²

Each rib supports the bridge deck with a series of reinforced concrete columns, each comprised of a pair of shafts connected by a transverse diaphragm "immediately under the floor beam." Arches were spaced at a distance of 32'-0" from each other (measured at the centers); "the center to center of columns was established with the idea of balancing as nearly as possible the dead loads from the floor beams and projecting sidewalk brackets."³

The reinforced concrete piers supporting the bridge rise above the deck as granite-faced pylons. Each approach has a pair of massive sculpted truncated pylons executed in a typical angular Art Deco style. Each pylon has low-relief sculptures depicting motifs tied to George Westinghouse's industrial achievements, as well as the region's steel industry.

HISTORICAL INFORMATION

The George Westinghouse Bridge was constructed to span the formidable natural barrier of the Turtle Creek along the Lincoln Highway (U.S. Route 30). In mid-August 1929, the Allegheny County Board of Commissioners entered into an agreement with the Commonwealth of Pennsylvania to improve a section of the Lincoln Highway in Allegheny County. Part of the proposed project was the construction of a bridge over Turtle Creek valley. Elimination of the "Turtle Creek Hill," wrote the *Pittsburgh Post-Gazette* in a 1929 editorial, would have a far-reaching impact:

The condition, called by one authority "the worst section of any road in the state," and remembered by many tourists as one of the unpleasant spots on nation-wide travels, would eventually have to be remedied. The hill is about to give way to progress....⁴

¹ G. S. Richardson, "A Concrete Arch of 460-Ft. Span," *Engineering News-Record* 106 (23 Apr. 1931): 681.

² Richardson, "A Concrete Arch," 681.

³ Richardson, "A Concrete Arch," 682.

⁴ "Big State-County Highway Project Is Given Approval," *Pittsburgh Post-Gazette* (15 Aug. 1929).

The Lincoln Highway in western Pennsylvania follows a number of established eighteenth-century routes, among them paths first used as military transportation facilities during the second half of the eighteenth century.⁵ In the vicinity of Turtle Creek valley, Braddock's Road — connecting the Monongahela River valley with the Potomac River at Cumberland, Maryland — was laid out in 1755. A second French and Indian War era transportation facility, the Forbes Road, more closely foreshadowed the Lincoln Highway right-of-way in western Pennsylvania.⁶

Turtle Creek is a tributary of the Monongahela River. Its deep, broad valley separates the borough of East Pittsburgh from North Versailles Township in eastern Allegheny County. Incorporated in 1895, East Pittsburgh was formed from parts of Braddock and Wilkins townships.⁷ In 1894, shortly before East Pittsburgh was incorporated, inventor George Westinghouse (1846-1914) moved his electric company from Allegheny City (now part of Pittsburgh) along the north shore of the Allegheny River to the hills overlooking Turtle Creek. Westinghouse, the bridge's namesake, had become a fixture of Pittsburgh's industrial landscape with his Westinghouse Air Brake Company, formed to manufacture the type of brakes that became standard equipment on all railroad rolling stock during the late nineteenth century. In 1893, the U.S. Congress passed the Railroad Safety Appliance Act mandating use of air brakes on all trains, further solidifying Westinghouse's position in the market and increasing demand for his air brakes.⁸

The Westinghouse Electric Company, incorporated in 1886, pioneered many modern conveniences, including standardized alternating current generators and other electrical systems. In the 1920s, Westinghouse-owned radio station KDKA became the first commercial radio station in the United States.

With the arrival of the massive Westinghouse complex, the Turtle Creek valley was rapidly transformed from a rural, sparsely populated area into a bustling industrial corridor. Increased population in the vicinity created greater demands for improved transportation facilities. When Allegheny County and Pennsylvania transportation officials struck their deal to reconstruct the East Pittsburgh-Turtle Creek Road and bridge, the end of years of transportation problems was in sight for local residents.

According to the deal, as reported by Pittsburgh newspapers, construction of the bridge would be Allegheny County's responsibility. Once completed, maintenance responsibilities for

⁵ Drake Hokanson, *The Lincoln Highway* (Iowa City: Univ. of Iowa Press, 1988), 44-6.

⁶ Robert Pilk, et al., *Reconnaissance Survey: Brownsville/Monongahela Valley, Pennsylvania/West Virginia* (Washington, D.C.: U.S. Department of the Interior, National Park Service, 1991), 30-3.

⁷ East Pittsburgh Centennial Committee, *East Pittsburgh, 1895-1995* (East Pittsburgh, Pa.: East Pittsburgh Centennial Committee, 1995).

⁸ Henry Thomas, *George Westinghouse* (New York: Putnam, 1960).

the proposed bridge would pass to the Commonwealth of Pennsylvania.⁹ The total transportation improvement project stretched for 5.4 miles, bypassing the old the Lincoln Highway right-of-way:

[I]t eliminates Turtle Creek Hill with its long 9 per cent grade, dangerous curves and heavy traffic congestion at the foot of the hill. It will relieve the heavy traffic congestion through the narrow and congested business and industrial streets of Turtle Creek and East Pittsburgh. A conservative estimate of time saved by the new route is 30 minutes.¹⁰

When the project was announced, it was estimated that the bridge would take two years to build.¹¹ Allegheny County proposed to pay for the \$1.75 million structure through a bond issue. At first, the bridge was called the "New Lincoln Highway Bridge."¹² On 16 January 1930, Allegheny County Commissioners read a letter from R. W. Wilson, a Westinghouse Electric and Manufacturing Company executive, "suggesting that this bridge be designated the 'George Westinghouse Bridge.'"¹³ The commissioners approved the request and forwarded the letter, with their recommendation, to Pennsylvania Secretary of Highways George Stuart.¹⁴

On 15 April 1930, bids from six companies were opened. The contract to construct the George Westinghouse Bridge was awarded on 6 May 1930 to the lowest bidder, Booth & Flinn Company, for \$1,482,754.50.¹⁵

⁹ Allegheny County, Pennsylvania, "George Westinghouse Bridge," in *Controller's 72nd Annual Report of the Fiscal Affairs of Allegheny County, Year Ending December 31, 1932* (Pittsburgh: Allegheny County, 1932).

¹⁰ Allegheny County, "George Westinghouse Bridge."

¹¹ "Big State-County Highway Project."

¹² Allegheny County, Pennsylvania, *Commissioners' Minutes*, vol. 12 (Office of the County Manager, Allegheny County Courthouse, Pittsburgh, Pa.), index.

¹³ Allegheny County, *Commissioners' Minutes*, 12:221.

¹⁴ A newspaper article documenting the bridge's dedication cites Thomas A. Dunn, president of the Pittsburgh Chamber of Commerce, as the source of the suggestion to name the bridge for George Westinghouse; see "Westinghouse Bridge Will Be Opened Today," *Pittsburgh Post-Gazette* (10 Sep. 1932). The newspaper cites a letter written by Dunn to the Allegheny County Board of Commissioners, dated 11 March 1929. The board's minute books, however, do not reflect the letter being received or read before the commissioners.

¹⁵ Allegheny County, *Commissioners' Minutes*, 12:297.

Booth and Flinn Company

Booth and Flinn Company of Pittsburgh constructed the George Westinghouse Bridge.¹⁶ The company was chartered 10 May 1927 by George H. Flinn, William F. Hill, and W. J. Wiseman.¹⁷ The firm was founded as “a general contracting business,” to engage in

the designing, constructing, enlarging, repairing and moving or otherwise engaging in any work upon buildings, roads, highways, manufacturing plants, bridges, piers, docks, tunnels, subways, tubes, shafts, water works, railroads, railway structures and all iron, steel, wood, masonry, concrete and each constructions and to own, manufacture and furnish the building materials and supplies connected therewith.¹⁸

George H. Flinn, the principal shareholder in the company, graduated from Yale University in 1897 and followed his father, William Flinn, into the construction business.¹⁹ The elder Flinn was an English immigrant who found work in several Pittsburgh brickyards before forming a partnership with James J. Booth. The predecessor to the Booth and Flinn Company was a limited partnership established 15 April 1893 by Booth, Flinn, George J. Albertson, and Robert McCance. The original Booth and Flinn Limited — capitalized at \$750,000 — was formed for

the construction of sewers, operation of stone quarries, manufacture of all kinds of paving material, the operation of brick yards and manufacture of brick and tile, the construction of buildings, the grading, paving and curbing, and otherwise improving of streets, alleys, roads and private property and to carry on a general contracting business.²⁰

The Booth and Flinn Company supervisor for the project was George Hockensmith. Samuel Eckels was the chief engineer of the Pennsylvania Department of Highways involved in

¹⁶ Pennsylvania Department of Transportation, *Historic Highway Bridges in Pennsylvania* (Harrisburg: Pennsylvania Department of Transportation, 1986), 164, incorrectly identifies the contractor as “Booth and Flynn Company.” This error was evidently repeated from Bill Stephenson, “George Westinghouse Memorial Bridge,” Allegheny County, Pennsylvania, Pennsylvania Historic Resource Survey Form, 1982, Pennsylvania Historical and Museum Commission, Harrisburg, Pa.

¹⁷ Allegheny County, Pennsylvania, *Charter Book*, vol. 60 (Archives, Allegheny County Courthouse, Pittsburgh, Pa.), 528.

¹⁸ Allegheny County, *Charter Book*, 60:528.

¹⁹ Pittsburgh Index Company, *Business Proclamation of the Pittsburgh Index* (Pittsburgh: Pittsburgh Index Company, 1903), 168.

²⁰ Allegheny County, Pennsylvania, *Partnership Book*, vol. 10 (Archives, Allegheny County Courthouse, Pittsburgh, Pa.), 60.

constructing the bridge and highway.²¹ The Allegheny County Department of Public Works administered the project.

Allegheny County Department of Public Works

The Allegheny County Department of Public Works, responsible for the oversight of design and construction of the George Westinghouse Bridge, was reorganized in 1924 to meet the demands of an ambitious county-wide bridge- and highway-building program. Prior to 1924, bridge building in Allegheny County fell under the purview of the County Engineer — an appointed position created in 1873.²² The County Engineer's office was one of five county departments responsible for the construction and maintenance of public works.²³

In 1923, the Pennsylvania legislature passed an act authorizing county commissioners to create a county planning commission. One of the nine original members of Allegheny County's Planning Commission was Norman F. Brown, a former head of Pittsburgh's City Works Department and a former engineer for the Pennsylvania Railroad.²⁴ Brown was appointed 7 January 1924 as Director of the Department of Public Works. He immediately initiated a substantial reorganization of the department that included concentrating all of the power in his office and the elimination of the forty-three-person staff that comprised the County Engineer's office. According to Farrington, Fenves, and Tarr, "The County Engineer's office was rendered useless as the staff was moved to other divisions."²⁵

Former County Engineer Vernon R. Covell (d. 21 December 1949) was once a major figure in the construction of Allegheny County bridges. He assumed the office in 1922 after the premature death of his predecessor James G. Chalfant. Covell was the engineer at the helm of Allegheny County's massive Allegheny River Bridge Raising Program after the U.S. Secretary of War determined in 1917 that six structures across that river were obstacles to navigation.²⁶ The reorganization of the Allegheny County Department of Works left Covell with no effective political power and placed him in an adversarial relationship with Director Brown. Farrington,

²¹ Richardson, "A Concrete Arch," 683.

²² P. M. Farrington, S. J. Fenves, and J. A. Tarr, *The Allegheny County Highway and Bridge Program 1924-1932*, Report No. R-82-132 (Pittsburgh: Carnegie Mellon Univ. Department of Civil Engineering, 1982), 44.

²³ Farrington, et al., *Allegheny County Highway and Bridge Program*, 44.

²⁴ Farrington, et al., *Allegheny County Highway and Bridge Program*, 46.

²⁵ Farrington, et al., *Allegheny County Highway and Bridge Program*, 47.

²⁶ For more information on the Bridge Raising Program, see U.S. Department of the Interior, Historic American Engineering Record (HAER) No. PA-447, "Washington Crossing Bridge," 1997, Prints and Photographs Division, Library of Congress, Washington, D.C.

Fenves, and Tarr excerpted a 1926 Allegheny County Controller's Report in which Covell's plight was detailed.²⁷

V. R. Covell, who had been County Engineer for some years, an unusually competent and representative man, was given a desk in the hallway of the building in which the Department of Public Works is housed where he has since languished without serious responsibility except to be used as a convenience when errors are made or things bungled by others in the Department.²⁸

As with many other Allegheny County undertakings, Covell was responsible for engineering design and construction issues related to construction of the George Westinghouse Bridge.

George Westinghouse Bridge

Construction of the bridge began 15 May 1930.²⁹ East Pittsburgh resident Frank Pribanic recalled working on the bridge, along with his brother, Joe. Both Pribanics worked setting dynamite for the bridge piers at a rate of forty cents per hour.³⁰

Progress in constructing the bridge was reported by *Engineering News-Record*. A series of four articles published between April 1931 and July 1932 documented the bridge's design and construction. According to the journal, three bridge alternatives were considered: a steel deck cantilever bridge with a 900'-0" main span, a steel deck cantilever bridge with five spans (the main one 450'-0"), and the concrete bridge that was eventually built.³¹

Although Booth and Flinn Company were awarded the contract to build the bridge for nearly \$1.45 million, additional contracts were let for ornamental work and paving. On 17 November 1931, sculptural work on the bridge's pylons was estimated at \$70,000.³² By the time the bridge opened in September 1932, its cost had risen to \$1.75 million.³³

Engineering News-Record reported that the structure required more than 3.5 million pounds of steel reinforcements and more than 70,000 cubic yards of concrete.³⁴ Construction of

²⁷ Farrington, et al., *Allegheny County Highway and Bridge Program*, 47.

²⁸ In *Historic Highway Bridges of Pennsylvania*, Pennsylvania Department of Transportation incorrectly cites Covell's position and affiliation. He is identified as "Pittsburgh's Department of Streets, chief engineer," 81, and as "Chief Engineer for Pittsburgh's Bureau of Bridges," 102.

²⁹ "Building America's Longest Concrete-Arch Bridge," *Engineering News-Record* 109 (21 Jul. 1932): 69.

³⁰ "Bridgebuilder, Councilman Recalls E. Pittsburgh History," *Pittsburgh Post-Gazette* (24 Aug. 1995).

³¹ Richardson, "A Concrete Arch," 680.

³² Allegheny County, *Commissioners' Minutes*, 12:713.

³³ *Pittsburgh Press* (11 September 1932).

³⁴ Richardson, "A Concrete Arch," 683.

the bridge was a challenge. The topography required that it be built to carry the Lincoln Highway at an elevation of nearly 200 feet above the floor of Turtle Creek valley. The piers were the first elements constructed. "Sunk as open caissons to a maximum depth of 85 ft.," they were embedded in a solid rock foundation.³⁵ "Concrete paving mixers were set up at each pier location, and all piers were poured to a height slightly above the arch spring line at the earliest possible moment, so that the arch centering could be set."

While construction was underway on the piers, the abutments were also under construction. Again, the sharp topography created some challenges: concrete for the east abutment, for example, had "to be hauled to the adjacent hill top and slid down a 400-ft. chute to the forms 135 ft. below."³⁶

Once the abutments were completed and the piers "concreted up to the arch spring lines," construction of the steel-truss centering began:³⁷

Steel-truss centering was used in all of the arch spans, so fabricated that it could be made to conform to the intrados of arches of different span lengths and so planned that the two arches at either end of the bridge would be first completed and then all of the centering assembled to support the 460-ft. span. A large amount of crossbracing was provided in the centering to resist wind pressure, in view of the long spans involved and the considerable rise of the arches.³⁸

The arches were concreted from a central mixing plant located "adjacent to one of the bridge piers at the lowest point in the valley to which aggregate could conveniently be trucked."³⁹ The concrete was mixed and then ascended in buckets to the forms by a cableway. According to *Engineering News-Record*,

Crushed limestone aggregate was used in the concrete for the ribs, columns and deck. It was batched by weight and required more care in placing than the gravel concrete that was used in the abutments and piers. Spans 1 and 2, on the east end of the bridge, were poured first, followed in order by spans 5, 4 and 3.⁴⁰

Although the *Engineering News-Record* reported that the bridge was completed on 28 December 1931, the structure did not open until 10 September 1932. Newspaper articles covering the bridge's opening suggest that the delay may have been caused by relocation of the Lincoln

³⁵ "Building America's Longest Concrete-Arch Bridge," 67.

³⁶ "Building America's Longest Concrete-Arch Bridge," 68.

³⁷ "Building America's Longest Concrete-Arch Bridge," 68.

³⁸ "Building America's Longest Concrete-Arch Bridge," 68.

³⁹ "Building America's Longest Concrete-Arch Bridge," 69.

⁴⁰ "Building America's Longest Concrete-Arch Bridge," 69.

Highway.⁴¹ The day of the bridge's dedication, the *Pittsburgh Post-Gazette* noted that its 450'-0" span was not only the longest concrete arch span in the United States, but it also was "the second largest in the world."

Contributing to the cost of the bridge were the elaborately detailed Art Deco pylons at its approaches. According to a 1983 newspaper article, Pittsburgh sculptor Frank Vittor was awarded the contract for \$46,000 to execute his design. An Italian immigrant who studied under architect Stanford White, Vittor began work on the sculptures in 1933, after the bridge was completed. Vittor, according to the *Press* article, was also responsible for several other high profile sculptures in the Pittsburgh region, including one of George Washington in Braddock and one of baseball player Honus Wagner located outside of Three Rivers Stadium in Pittsburgh.

The ceremony dedicating the bridge attracted a crowd of more than 30,000 people, according to one newspaper account. Shortly after the bridge was dedicated, traffic flowed across its spans at a rate of eight thousand vehicles per hour.⁴² The dedication ceremony included a parade and speeches by local officials and by Herman H. Westinghouse, George Westinghouse's brother.⁴³

The George Westinghouse Bridge, once it opened, became the responsibility of the Pennsylvania Department of Highways (now PennDOT). Although the bridge has remained a vital transportation link in Allegheny County since its opening, it has outlived the manufacturing plant built by its namesake and which necessitated its construction. In 1988, the Westinghouse plant shut its doors and its employees joined the throngs of other victims of regional deindustrialization.

One notable aspect of the George Westinghouse Bridge's history is its popularity as a site to commit suicide. By early 1983, many people had ended their lives by leaping more than 200 feet to the valley below.⁴⁴ There also have been a number of accidents in which people have fallen from the bridge. The bridge's first casualty was a construction worker who tumbled from a beam in December 1931. One of the most spectacular events on the bridge was the July 1954 rescue of two children who had climbed one of the arches.⁴⁵

Beginning in 1976, PennDOT recognized that the aging bridge would require major repairs. That year, the bridge's westbound curb land was closed because the arch rib supporting it had become seriously deteriorated.⁴⁶ For eleven months in 1983, the bridge underwent a

⁴¹ *Pittsburgh Post-Gazette* (10 Sep. 1932).

⁴² "Westinghouse Bridge Draws Many Visitors," *Pittsburgh Post-Gazette* (12 Sep. 1932).

⁴³ *Pittsburgh Press* (11 Sep. 1932).

⁴⁴ Steve Halvonik, "The Bridge of Size," *Pittsburgh Press* (20 Jan. 1983): E-4.

⁴⁵ Halvonik, "The Bridge of Size," E-4.

⁴⁶ Halvonik, "The Bridge of Size," E-4.

massive \$11 million program of repairs that included a new concrete deck and rehabilitation of its massive concrete arches.⁴⁷

The George Westinghouse Bridge was listed in the National Register of Historic Places on 28 March 1977.

⁴⁷ Ken Fisher, "Westinghouse Bridge Open Again," *Pittsburgh Post-Gazette* (23 Nov. 1983): 3.

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